A SUMMARY OF THE U. S. GEOLOGICAL SURVEY NATIONAL WATER-QUALITY ASSESSMENT PROGRAM

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DONALD PAUL HODEL, Secretary

U. S. GEOLOGICAL SURVEY

Dallas L. Peck, Director

For additional information
write to:

Office of Water Quality
U.S. Geological Survey
412 National Center
Reston, Virginia 22092

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Beginning in 1986, the Congress has annually appropriated funds for the U.S. Geological Survey to test and refine concepts for a National Water-Quality Assessment (NAWQA) Program. At present, the program is in a pilot phase with field studies occurring in seven areas around the Nation. In 1990, a committee of the National Academy of Sciences will complete an evaluation of the design and potential utility of the program. A decision about moving to full-scale implementation will be made upon completion of this evaluation.

The program is intended to address a wide range of national water-quality issues that include chemical contamination, acidification, eutrophication, salinity, sedimentation, and sanitary quality. The goals of the program are to:

1. Provide nationally consistent descriptions of current water-quality conditions for a large part of the Nation's water resources;

2. Define long-term trends (or lack of trends) in water quality; and

3. Identify and describe the relations of current conditions and trends in water quality to natural and human factors.

This information will be provided to water managers, policy makers, and the public to provide an improved scientific basis for evaluating the effectiveness of water-quality management programs and for predicting the likely effects of contemplated changes in land- and water-management practices.

FUNDING HISTORY

FY1986: $2.5 million (Public Law 99-190)

FY1987: $7.0 million (Public Law 99-591)

FY1988: $7.0 million (Public Law 100-202)

APPLICATIONS OF NAWQA INFORMATION

Information on general environmental levels of pesticides and other synthetic organic compounds, nutrients, certain metals and trace elements, and sediment will be provided by the program on a continuing basis for the Nation's surface- and ground-water resources.

The information will include summaries of the probability distributions of constituent concentrations in surface water and ground water, as well as estimates of surface-water transport of important substances past key streamflow stations. Limited data of this type are available for many constituents of current concern. The assessment will identify some chemicals that occur more frequently than expected in surface and ground waters, as well as certain substances that are expected to occur, but do not. This type of information will be useful to Federal, State, and local agencies in helping them to identify the most important substances to study for exposure assessment, toxicity, or treatment in drinking-water. The information will also help them to target additional substances for which regulations are needed.

Information on the geographic distribution of contaminants will be provided for the Nation's surface- and ground-water resources.

These descriptions will help identify areas with water-quality problems, as well as areas with generally high-quality water. This information will help various Federal, State, and local agencies in the allocation of resources for water-quality management and protection. Major problem areas identified by the program will be candidates for more detailed study by other programs of the Geological Survey or by other agencies. Knowledge about regional differences in the occurrence of particular classes of chemicals will aid the formulation of monitoring requirements by other agencies. For example, laboratory analyses for many substances of current concern are very expensive; thus, information leading to reductions in the list of substances that require monitoring in particular regions or in the frequency of monitoring, can result in considerable savings.

The NAWQA Program will provide a national 'barometer' of long-term trends in both surface- and ground-water quality.

This information will enable the public, policy makers, and resource managers to ascertain the manner and degree to which water quality is improving or degrading, and whether long-term water-quality protection programs are achieving desired results. The role of the program in providing consistent water-quality information over time is analogous to the roles of the Census Bureau, the National Center for Health Statistics, and the Bureau of Labor Statistics in the areas of demographic, health, and economic information.

Information on factors that affect water quality will be provided to relate the occurrence and concentrations of various chemicals to different hydrologic environments, land uses, and human activities.

An understanding of these relations will provide a basis for predicting where and when certain types of contamination problems are likely to occur and for determining the large-scale effects of alternative water-quality management strategies.

DESIGN

If, after the evaluation, a decision is made to fully implement the program, it will be accomplished through investigations of about 120 study areas that are well dispersed throughout the Nation and that incorporate about 80 percent of the Nation's water use.

The areas studied, referred to as study units, are a combination of river basins in which the focus of attention is on surface-water quality, and aquifer systems in which the focus of attention is on ground-water quality. The emphasis on surface- and ground-water quality in a given unit will depend on the degree of interconnection between surface water and ground water. The study units are a few thousand to several tens of thousands of square miles in surface area.

Communication and coordination between U.S. Geological Survey study teams and program staff and Federal, State, and local water-managers are important components of the program.

Each study-unit project has a liaison committee, consisting of representatives from other Federal, State, and local agencies to ensure that the scientific information produced by the project is relevant to local and regional interests. In addition to the liaison committees, a National Coordinating Work Group has been established to advise the Geological Survey on the program.

The study units will be linked together to form a national program in several ways.

- Data will be collected and interpreted on a nationally consistent set of water-quality constituents;

- A prescribed set of study approaches and documented protocols for sample collection, sample handling, laboratory analysis, and quality assurance will be followed;

•Similar summary information and written reports will be produced for each study unit; and

•Data will be stored in national data files.

National coordination will be provided from regional and headquarters staffs and through national meetings involving study teams from all units. A staff will be dedicated to doing national and broad regional interpretations of water quality using the new water-quality data from the program, as well as comparable data from other programs of the Geological Survey and other Federal and State agencies.

By conducting the national program as an aggregation of many individual study units, the assessment will provide results that are useful in understanding and managing the resources of the study unit, as well as answering national-scale questions about water quality.

The objectives for the water-quality assessment include providing general statistical measures of water quality and information on the location, nature, and cause of principal water-quality problem areas. To provide the latter type of information in a meaningful manner, the program will rely on region-specific knowledge of Geological Survey scientists and other hydrologists familiar with local situations. A key feature of the program is that it is perennial; this is in contrast to a "one-shot" national statistical design. The perennial nature of the program provides an opportunity to adapt to improve knowledge about hydrogeology of individual settings, the spatial distribution and behavior of various contaminants in these settings, and the temporal trends in the data.

Assessment activities in each of these study units will be done on a rotational rather than continuous basis.

Three to 5-year periods of intense data collection and analysis will be rotated with longer periods during which the assessment activities will occur at a low level of intensity. Thus, only a subset of the full suite of study units will be investigated at a high level of activity at a given time.

The program will focus on conditions that are large in scale and persistent in time.

The program will emphasize regional degradation of water quality such as occurs from nonpoint sources of pollution or from a high density of point sources. The program is not a replacement for smaller-scale studies presently conducted by many agencies, but as a complement to them, to achieve insights not possible from the individual small-scale studies.

A set of national target variables will be established to enable the assessment to provide interpretations of water quality at the national scale.

The national target variables will consist of a common set of physical measurements, inorganic constituents, and organic compounds that are included in sample analyses for all study units. In addition, target variables will be selected for each study unit by the project team to supplement the national list.

A number of biological measurements will be selected for use in the assessment.

Biological measurements will be used in the assessment to assist in: (1) defining and quantifying biological processes that affect physical and chemical aspects of water quality; (2) determining the sanitary quality of surface and ground waters; (3) determining the occurrence, distribution, and fate of certain contaminants; and (4) assessing the relations between the physical and chemical characteristics of streams and the functional or structural aspects of the biological community. Discussions on the role of biology and the availability and applications of biological measurements in the program with scientists in the U.S. Fish and Wildlife Service, U.S. Environmental Protection Agency, and other Federal and State agencies and universities are on-going.

For additional information about the program, contact William M. Alley on matters pertaining to ground water (Telephone: 703-648-5710) or William G. Wilber on matters pertaining to surface water (Telephone: 703-648-6878), Office of Water Quality, Mail Stop 412 National Center, U. S. Geological Survey, Reston, Virginia 22092.